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Thank you very much. I am delighted to be here with your Federation today and have this opportunity to talk to you about our nation's program.

Women have played a prominent role in the space program in the United States, from the pioneer efforts of Mrs. Robert Goddard, the wife and working associate of our great rocket pioneer. We have, of course, on the platform today Dr. Picard, another famous woman scientist, and I am proud to say that within the Nasa organization, we have many, many women scientists and executives in prominent positions, people like Mrs. Nancy Roman, who heads up our astronomical programs.

We have, I think, as we move from the first decade of the space program to the second, even more opportunities for ^{Wo}men to make contributions to the space program, and it is our sincere hope that more women will be attracted into this area. My prediction is that in the second decade of the program, we will indeed have women in orbit, and on the surface of the moon, working to advance our scientific knowledge, and our technology in this important area. This is a prediction, and it is interesting to look back at some of the previous predictions of the Space Era.

Just over a hundred years ago, Jules Verne, that famous science fiction writer, wrote a very interesting book called "From the Earth to the Moon," in which he made some astonishingly accurate projections. In this story, he predicted that the venture to the moon would be

made by that exuberant American Republic; that it would be the result of a post-war artillery development made in very large form for the purpose. He predicted that there would be quite a squabble between Florida and Texas for the privilege of being the launching site, but that Florida would win, and that the launching would take place from the South of Florida.

He predicted that an aluminum capsule would be employed containing three people and maneuvered in space by rocket jets. He foresaw the zero G condition that the astronauts would encounter, and he ~~was~~ wrote his story, including a safe return to earth, by the process of aplatation, entering the atmosphere, landing in the Pacific, and being retrieved by a United States Naval vessel.

Now that's a pretty good vision for a century ago, as we head into the last part of the first decade of space, and prepare indeed to launch the first United States attempts at the moon before the end of next year.

We, of course, ~~are~~ are going to be using a large rocket instead of the cannon that Jules Verne predicted; but it is a highly enlarged version of a wartime development. You all recall the V-2 weapons, the liquid fuel rockets built on the technology of Robert Goddard, but these were, by today's standards tiny vehicles indeed, fourteen tons, compared to the mighty 3,000 tons of our Saturn 5 moon rocket.

Our moon rocket stands 360 feet high. The first stage will have 7-1/2 million pounds of thrust; and to give you ~~some~~ some idea of what that means, we've got to pump 15 tons of fuel into the rocket engine every second using pumps of 300,000 horsepower. What this means is that the giant

carriers that our Navy employs do not have enough propulsion capacity to even run the pumps on this giant moon rocket.

As it takes off from Cape Kennedy and gathers speed, the first stage drops off and the second stage, using liquid hydrogen and liquid oxygen at ~~as~~ temperatures close to absolute zero, move the rocket on up to earth ~~orbit~~ orbit.

The third stage injects it into earth orbit, at the end of which corrections are made; and at a speed of 18,000 miles an hour, a bead is drawn on the moon. At this point, the third stage re-starts, and takes the Appolo capsule up to a speed of 25,000 miles an hour for escape from the earth's gravity field and its 70-hour coasting on out to the moon.

At ~~this~~ that point, a ~~break~~ braking rocket is put into ~~space~~ place. Two of the three-man astronaut crew separate into a lunar landing capsule, fire retrorockets for a landing on the moon, and spend about twenty-four hours exploring the surface in the immediate vicinity of their landing point, after which they return to lunar orbit and rendezvous with the Appolo spacecraft, and the three of them then return home, blazing into the atmosphere again at 25,000 miles an hour; then deploying parachutes for a water landing and recovery.

This is surely the great engineering and exploration adventure of the decade, and perhaps of many decades.

Well, here we are then entering into the end of the first decade of space exploration with this tremendous accomplishment behind us. What is the meaning of this? I think that what we see here is a great demonstration

of the determination and vision of the American people in our ability to flexibly create new institutions to take on major national purposes.

We have spent 25 billion dollars on this program over the last decade, and we have involved over 200,000 workers in 20,000 separate individual companies. Over 200 universities have been organized into this effort. "Why should we go to the moon " is a question often asked. "Should we devote this tremendous resource to the space area? Why don't we instead cure cancer, or rebuild our cities " people sometimes ask.

I would like to talk on this, because it is certainly true that the exploration of space is expensive. It is very difficult to do, and it's even a dangerous enterprise. But the returns that we have already had from our space program, in the opinion of many of us, more than justify this mighty national effort.

We have already seen in the very first decade of space meteorological ~~sat~~ satellites which now, for the first time, give us a total picture of the world's weather from a vantage point high in space, 25,000 miles out. From this, the whole science of weather forecasting and meteorology have moved ahead with giant strides.

Forty-seven different countries around the world are now routinely receiving from our satellites as they pass overhead extremely valuable information on the weather in their area.

As we look ahead to future weather satellite systems, it is clear we have only begun to exploit this tremendous capability that the space age has made possible.

The communications satellite area is another great advance that's already been made. Our children are now used to seeing displayed in the bottom of their television screen "brought to you via satellite," and in fact we have even seen the first pictures with the caption "live from the moon," as our spacecraft has sent back photographs of its surface.

We accept now communications satellites and weather satellites as commonplace, and yet even ten years ago many people did not feel that these things were possible.

The very visionary science fiction writer, Arthur Clarke, as late as 1957, made a very tentative prediction that admitting it might seem ludicrous to talk about commercial advantages of space, nevertheless the airplane, in its first thirty years, had risen to commercial exploitation, and he thought perhaps space, in an even shorter time, might have commercial significance. And yet less than seven years later, the Communication Satellite Corporation was floating a hundred million dollars worth of stock to open its international services.

It is well to bear in mind that less than forty years after Lindbergh's pioneering flight across the Atlantic, 20,000 passengers a day were flying between the Continents. This is the kind of technological pace that we have become perhaps accustomed to in the space age, and it is right that we should expect this of our scientists and engineers. But I think sometimes we fail to appreciate the rapidity with which these things are being made available to people.

As we move into the second decade of the space age, we are begin-

now increasingly to see the usage of navigation satellites for pinpointing the position of vehicles on the surface of the earth. We are familiar with geodetic satellites which are giving us new insight into the whole surface topography of the earth. I won't even go into the subject of military surveillance satellites which are doing such things as making sure that there are no violations of the nuclear test ban treaty; but experts have said that these satellites alone would have justified the entire cost of the space program. And just around the corner are new earth resource satellites which will monitor the status of the world's agriculture, and forestry, and minerals, and bring whole new understanding of the wealth of the earth to mankind.

And in addition to these benefits that are already coming in the first decade, we see a host of technological ~~spin~~ spinoffs. I think all of you in this room are highly concerned with the status of our nation's education, and you all recall the great impact that Sputnik had across this country as we re-examined the entire approach that we were taking to education, not only in the secondary schools, where new mathematics programs, new physics, new chemistry, but in the colleges. NASA has been sponsoring new Ph.D's to the tune of a thousand a year to help provide the support for our space program.

But more broadly, and more philosophically, I'd like to suggest that going to the moon is really not the name of the game here. The moon is a very valuable goal that, in his great wisdom, President John F. Kennedy set for our nation's space program. But it is not in itself the final objective. It is merely a visible manifestation of the development of the United States as the foremost space-faring nation of the world. In selecting the Appolo

moon project, we were able to focus our efforts. We were able to pace them. We were able to fuse the talents and capabilities of vast numbers of people across the country to demonstrate in a public test the capability that our nation was developing in this area. And this is the real reason behind the lunar program.

There are many reasons for going to the moon itself, but fundamentally it is a capability to operate in deep space and successfully explore and take advantage of this new ocean that stretches before us.

I would predict ~~x~~ that as a result of this new effort of our time, and as we enter the second and third decades of the space age, that we should see a ~~flowering~~ flowering of the arts and science the like of which perhaps we would have to go back to the days of the Renaissance and the European exploration of the globe to parallel. It is no accident, I think, that Shakespeare lived at the time of the great English exploration of the world. It is no ~~an~~ accident, I think, that Western Europe saw its great flowering in the decades of Portugese and Spanish and Dutch exploration of the entire world. And what developed in Western Europe as a result of this was an entirely new world view, a new view of man himself, and a new view of the environment in which he lived. And this viewpoint is perhaps the most precious heritage that has come down to us; because today, although we can trace back many different cultures that have contributed to our present culture, I think fundamentally the thing that distinguishes us is our broad world view. Whether it's physics, atronomy, whether it's the humanistic sciences, we in the West are distinguished by this breadth of vision which has stood us in such sound stead.

Here in the ~~Unrix~~ United States, there is another broad feedback from our entire space program that I would like to emphasize. We have always, I think, in this country, been extremely innovative and capable in inventing new institutions to accomplish our national purpose. From the days of 1776, when our forefathers brought forth an entirely new political system, we've been willing to experiment, and we've been idealistic, and we've been dissatisfied with things as they are and wanting to press ahead into ~~now~~ new and more advanced areas.

During the 1930's, we created the Tennessee Valley Authority. We had Operation Bootstrap to remake Puerto Rico. The Atomic Energy Commission to develop the tremendous power of the atom. We've seen many institutions, and not all of them of a governmental type -- the March of Dimes, for example, coupled with the Public Health programs, has removed the scourge of polio from children everywhere. This is the kind of thing that the world looks to America for, and it is the sort of thing that I think we're proud of.

In the 50's -- in the 60's now -- we are embarking on this new great national enterprise, the space program, with the new institutional invention -- ~~HA~~ NASA -- and from this other new institutional inventions, such as the Comsat Corporation, which ~~has~~ was chartered by Congress to handle our space communications; and beyond that the Intersat, the International Communications Satellite activity, in which our vision is of a very advanced world satellite communication system which is standardized and able to talk to many people in many countries, rather than many individual

noncompatible systems.

These then are some of the other spinoffs from the moon program. I don't want to de-emphasize, however, the role of the space program as a scientific and technological venture with values in its own right. Yesterday we deployed for the first time the enormously long booms of our radio astronomy satellite which was launched a week or so ago. The meaning of this is that for the first time we will be receiving radio waves from outer space in regions of the spectrum which man has never been able to comprehend. It is an entire new area that is opening up this week, as these booms deploy, as we begin to get the first signals in this whole new area of science.

What does it mean for the future? Well, some of these things ~~are~~ are hard to predict. Certainly we know that as man conquers space, we'll have to put into place vast new systems. The support of a colony on the surface of the moon, the construction of giant space stations are surely things that lie in the decades ahead.

It is very difficult still in the first decade of the space age to foresee the resources required and the applications that will flow from these. But it's always been difficult. It was difficult in the days of the Wright Brothers. In fact it would have been impossible to have had a vision of the vast international air flights of today.

When Michael Farraday was playing with little magnets and coils of wire, he couldn't possibly have envisioned the tremendous electrical power grid that today powers the United States; and surely Henry Ford had no idea of the tremendous impact on American life that the automobile, mass-produced, was going to have.

So we look to the future with a good deal of confidence, and a good deal of a fascination, as we try to understand what the space age is going to mean to mankind.

But what about this question of national priorities? Shouldn't we, instead, be putting more money into our cities? Shouldn't we perhaps be doing more about such urban problems as crime, and poverty, and ignorance, and violence?

Surely these problems should have a very high priority indeed on a national scale of values. It is a disgrace to this nation that we should allow these to continue; yet at the same time, I would like to make the point that we have progressed in this country in the social as well as the technological areas, I think at the most rapid paced during times of great challenge; during World War I and World War II, we made vast strides ahead, and I think that in the space age we see the opportunity to substitute for all of the evils of war a new form of stimulus to this country which I think facilitates the advance of such things as Civil Rights.

What we are really talking about here is the impact of technology on our society. The ghettos of our cities are artefacts of the great successful cultural revolution in which we brought to bear science and mechanization to produce the great bread basket of the United States, and do this at productivity levels that took away the back-breaking labor of the tenant farms in the South. As this form of manpower became obsolescent, people were displaced into our cities, and these people were not properly trained for life in an urban, industrial environment. They were not prepared to take their place in our

modern society and contribute to it and receive in turn the benefits from it.

Looking back on it, we should have foreseen this, and we should have put programs in place that were perhaps bolder and more imaginative to ameliorate the difficult conditions.

I think, however, that we are now facing up to this task in a much finer fashion, and I am optimistic that we will make progress.

Organizations like yours expressing the concern that you have in this area is the kind of thing I think that is going to bring success in this effort.

We must always remember that although we in the United States go through times of doubt and self-criticism, that we are still the mightiest nation that the world has ever seen. We are indeed the nation that eliminated polio. We are the nation that introduced the computer, atomic energy, scientific and mechanized agriculture, the airplane, the mass-produced automobile, and the home appliance, and the electric light, and we of course could go on and on. And it is right that we should occasionally pause and re-examine our national priorities; but at the same time we shouldn't fall into the national equivalent of hypochondria, become so concerned with our internal workings, argue among ourselves so much as to whether everything is all right or not, that we fail to be bold enough to press forward.

I think we have been perhaps turning inward somewhat excessively in the last year or so under the great pressures of the war in Vietnam, the risk, the threats of inflation, foreign exchange problems, and the pxx problems of our cities.

But when you look at the progress we're making in fields such as civil rights, education, I think that there is a good deal of health in this country too, and I hope that we're reaching the end of the gloom and doom period and getting back on the track.

We in the area of space and aeronautics certainly see this as a time of great forward movement. The work that we have done in the area of jet transport, for example, has become an enormously strong part of the nation's economy. Last year, we produced 2-1/2 billion dollars worth of jet transports in this country for use not only in the United States, but all around the world. This year we will be producing 3.8 billion dollars, and the backlog on the order books of American aerospace companies for jet transport alone is now measured in 8 billion dollars.

This is the result of the aeronautical research and development in past years, and of the continuing efforts that we have in this area.

I should also mention the electronic computer industry, without which the space age would not have been possible. This is an area of our technology, and our economy that has also had tremendous infusions from the space program. Today we can process data in small satellite computers that would fit on top of the lectern here that several decades ago would have occupied the entire hall.

We have moved even in the last few years from the kind of data transmission capability which brought back the 1964 photographs from the surface of Mars that showed those dramatic craters to the capability in the Mars ~~px~~ problem that we will launch this year that is two thousand times greater.

In the area of electronics, we have been able to go in fifteen years from bouncing a few very weak signals off the ~~su~~fa surface of the moon to highly accurate measurements of the distance of Venus, and its rotation period. This is an advance in this ~~period~~ ^{of} of time /ten million in capability.

Now to make that come home to you, this means that if we could have done this in the area of personal income, a person earning \$5,000 a year would have an annual income of five billion dollars. So you can see that this kind of advance is indeed an impressive one.

Well, this then is a report to you of where we stand as we enter the second decade of the space age. NASA's tenth birthday will occur next October. It is a time for sober reflection on what this program means to the country, what it means to those of us in it, what it means indeed to men all over the world.

We welcome the opportunity to reassess the values that our society places on the different endeavors which we have under way. It is a healthy thing, and something that we are in full sympathy with. At the same time, I think it is important that we in the United States assess carefully the kind of a nation that we are, and the kind of a nation that we want to become; and it is important that having made such a decision, we ~~are~~ are willing to make the sacrifices for the future that programs like our research in space truly represent.

That is really the message of NASA, I think, the message of a democratic society that freely, and of its own will, has set for itself difficult

goals and is forging ahead to realize them.

NASA is perhaps unique among peacetime organizations in setting for itself a publicly measured goal, like the landing on the moon in this decade, and the safe return of the astronauts, a goal which can be seen by all people all over the world in real time, as next year we move toward its accomplishment.

This is the kind of public program that, frankly, I would like to see in other areas of our society, including very much such social areas as the war on crime, for example. This again, I think, is a message that NASA perhaps has for all of us.

So it is with considerable confidence that we in NASA look to the future and look to the nation that supports us in this bold venture, this great adventure indeed of our times. I think that our children and our children's children will look back on the late 1960's and wonder why we ever doubted the tremendous importance of opening up the pathways to the stars.

Thank you.

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